

Components of Catastrophe: Social and Environmental Consequences of Omo River Basin Development

5

Abstract

The Gibe III dam and its associated agricultural development would cause radical reduction of Omo River flow and inflow to Lake Turkana, as well as elimination of the Omo River annual flood—all essential to the survival of a half million residents of the lower Omo basin and the Lake Turkana region. These major changes would destroy the Omo riverine natural resource systems—eliminating ‘last resort’ grazing lands for livestock, flood recession agriculture and fishing habitats throughout the lowermost Omo basin. The impending destruction of indigenous survival systems is heightened by the Ethiopian government’s expropriation of tens of thousands of villagers for large-scale, irrigated commercial agricultural enterprises, accompanied by political repression of communities throughout the region. Pastoralists and fishers residing near the western shoreline of Kenya’s Lake Turkana also face economic collapse—primarily due to radical lake level drop causing destruction of fish habitat, lakeside grazing for livestock and potable water. As in the lower Omo basin, these conditions would produce massive scale hunger along with widespread disease. Rapid escalation of armed conflict in the cross-border region would ensue as ethnic groups battle over vanishing food sources.

Radical Reduction of River and Lake Waters by Omo Basin Development

- If the Gibe III dam is completed and brought into operation, it will radically reduce the Omo River’s downstream flow volume as well as the inflow to Lake Turkana, by at least 60–70 %, according to ARWG physical scientists Fig. 5.1). This does not take into account:
- Seepage from the reservoir with a drawn-out, if not indefinite, filling period—due to the highly fractured nature of basalts and other volcanic rocks at the reservoir.
 - Abstraction of Omo River waters by the planned system of GOE and commercial irrigation agricultural schemes along the lower Omo River. Utilizing estimates of the extent of irrigation, including figures from Human Rights Watch and the Oakland Institute, the consultant for the AFDB (2010) Lake Turkana assessment later estimated that abstraction of river water for the planned irrigation agricultural enterprises would cause up to a **50 % reduction** of Lake Turkana’s water inflow from the river with a **lake level drop of 20 m or more** (Avery 2012).
 - Failure to implement artificial flooding because of reservoir fill delay and GOE prioritization of electricity generation over the release of reservoir water for downstream indigenous economies.
 - The sustainment of an artificial flood program is actually disclaimed by the GOE itself (see Chap. 6).

The drop in lake level caused by the 60–70 % Omo River flow volume loss during closure of the Gibe III reservoir and early operation of the dam would be in addition to rather than “within the range” of the lake’s annual fluctuation. The latter is incorrectly asserted by the GOE downstream impact assessment (2009b) and the two major

development bank impact assessments (EIB 2010; AFDB 2010). Annual fluctuations in lake level are about 1–1.5 m, but longer-term changes in the lake level are much larger. For example, the lake level dropped 10 m between 1975 and 1994.

A drop in the lake level of at least 10 m during the first years of reservoir filling and operation is a far more likely scenario. The maximum depth of the lake is 109-m, with a mean depth of 30-m. Its shoreline zone is markedly shallow in most of its central and northern zones. Figure 7 indicates the progressive retreat of Lake Turkana in relation to water level drop.

An ARWG physical scientist has calculated the probable drop in the level of Lake Turkana during reservoir fill and operation. The scientist's calculations relied heavily on a paper by Cerling (1986) concerning a mass-balance approach to sedimentation in recent Turkana basin history. Considerations included the following:

- The highly fractured nature of the basalt rocks in the reservoir rocks, suggesting a high level of *seepage* into the rock structure. By ignoring seepage losses, the official reports estimate a reservoir-filling period of two to three years, which is unrealistically short.
- The hydrology of the Omo River basin is misrepresented in the official reports. GOE and development bank reports suggest that a greater portion of the Omo River's discharge into Lake Turkana comes from the region below the Gibe III dam than is actually the case. In general, waters from the Hamar mountain range (Fig. 1.3) or the Omo basin lowlands do not reach the Omo River. Instead, these waters evaporate in flood basins and seasonally inundated pans.
- The “*huge evaporation losses*” from “*excessive*”, or “*uncontrolled flooding*” repeatedly asserted in the GOE's downstream impact assessment (GOE 2009b)—and referred to in the development bank impact assessments—do not in fact occur.
- Areas of sub-basins of the Omo River were measured from satellite imagery, with precipitation in each estimated from available maps and tables. The evaporation rate from the surface of Lake Turkana was calculated.

A 7-m drop in lake level is likely during the first years of reservoir fill and operation, depending on the amount of river abstraction for irrigation, regional weather patterns and other factors. An increase in the concentration of ions in the lake from about 2330 to about 2800 mg/l is predicted.

Figure 5.1 indicates the relationship between elevation and volume for Lake Turkana.¹

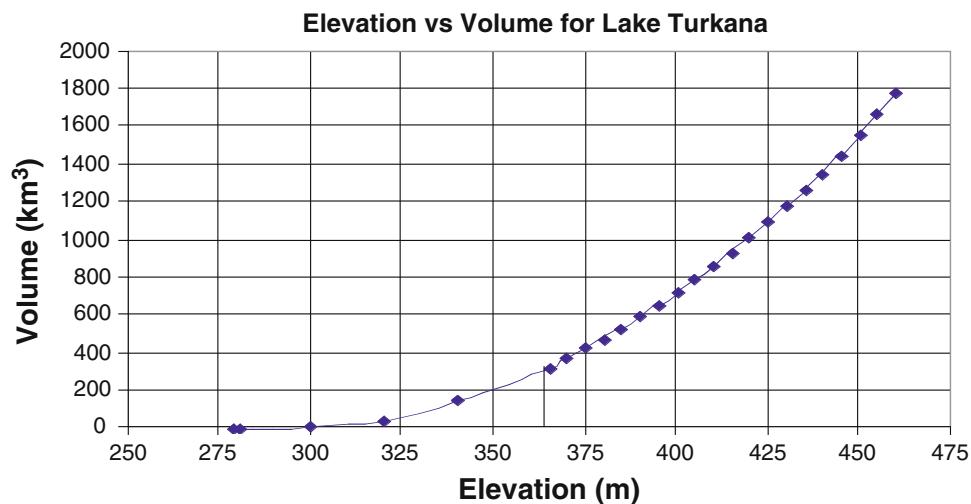


Fig. 5.1 Elevation of Lake Turkana relative to lake volume. *Source* ARWG geologist, personal communication.

¹This calculation by the ARWG physical scientist was included as Appendix A in Carr (2012).

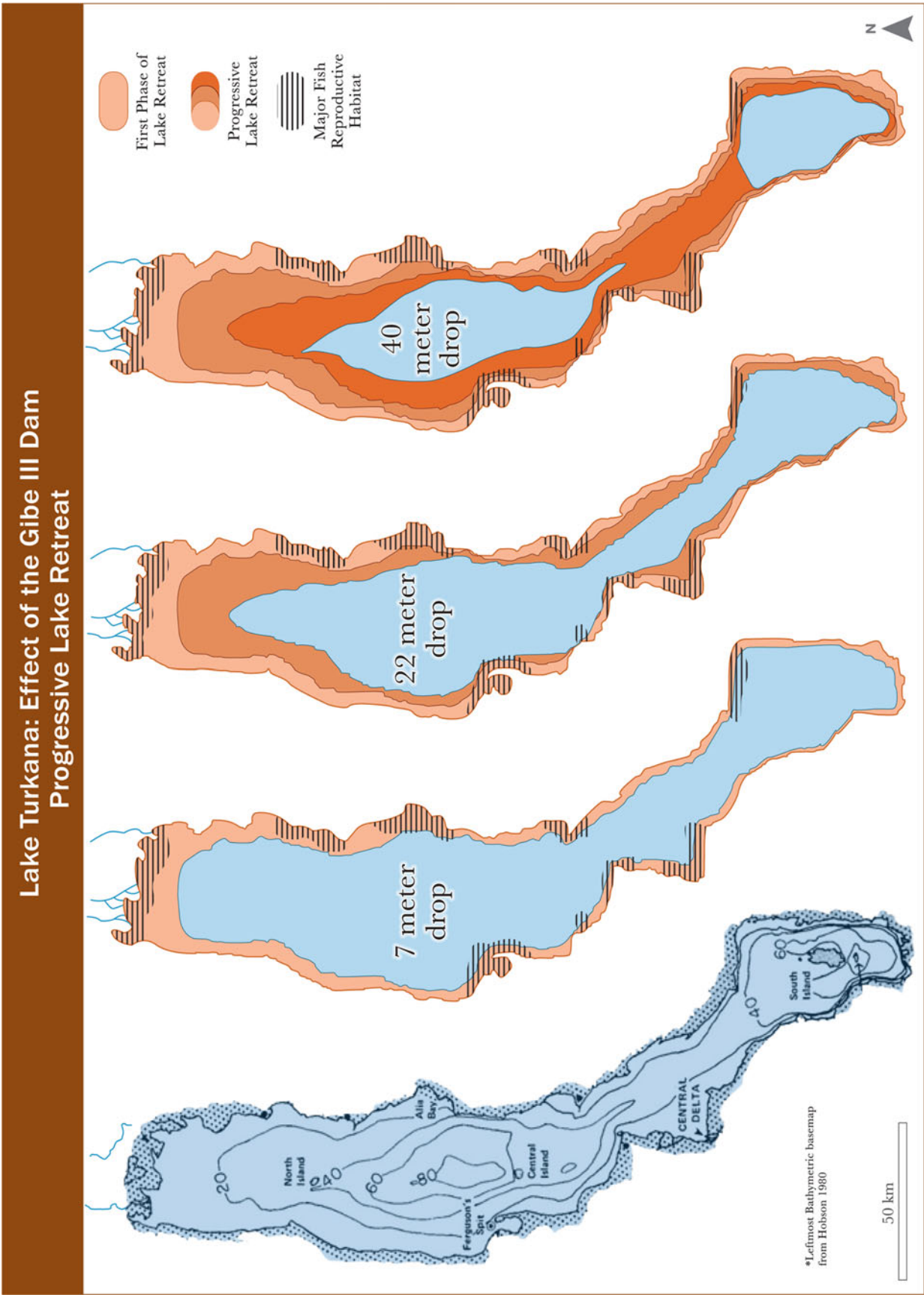


Fig. 5.2 Progressive retreat of Lake Turkana caused by the Gibe III dam and dam enabled irrigated agriculture (Base map from Hopson 1980)

Figure 5.2 indicates the progressive retreat of Lake Turkana relative to reduced lake volume, based on bathymetric measures by Hopson (1982). The maximum depth of the lake is 109 m, with a mean depth of 30 m. Its shoreline zone is markedly shallow in central and northern zones.

Even during a realistic reservoir-filling and initial dam closure period, these effects include:

- Disruption of chemical balance and biological systems—including fisheries.
- Rapid decline/death of the Omo riverine forest and woodland.
- Drying out of riverside flats and the Omo delta—including flood recession, grazing and fishing areas.
- Cessation of the Omo's annual pulse of freshwater and sediment into the lake, with salinity increase and radical reduction of critical nutrients.
- Major southward retreat of Lake Turkana with desiccation of its northernmost zone, bays and shoreline areas (Fig. 5.2).
- Destruction of major fish reproductive habitat along the river, within the modern Omo delta and in Lake Turkana's central and northern shoreline areas.

The former consultant for the AFDB's 2010 Lake Turkana impact assessment, in a later report written for the University of Oxford (Avery 2012) **calculated a 7-m drop in lake level of Lake Turkana and a drop of at least 20 m accompanying a 64 % abstraction rate**. These estimates are in line with those of ARWG physical scientists (ARWG 2009). The scenario of creating another Aral Sea disaster is raised in the 2013 Avery report—an image also presented in an article produced by the U.S. based NGO International Rivers (2013).

➤ **Even the predictable 7-m drop in lake level during the reservoir filling period and early dam operation would have catastrophic effects throughout the region.**

- The environmental dimensions of this destruction include: death of the riverine forest, desiccation of the Omo delta and northern end of Lake Turkana, elimination of flood recession agriculture along the river and throughout the delta, destruction of riverine and lakeside grazing and watering resources, and destruction of fish reproductive and life cycle habitat.
- The livelihood and associated human destruction include major new mortality of livestock with decimation of remaining herds for countless pastoral villages and households, destruction of the vast proportion of flood recession agriculture and collapse of fishing livelihood around Lake Turkana and in the Omo delta region. As a result, indigenous residents would face catastrophic conditions of malnutrition and starvation, with major spikes in disease—even epidemic levels of dysentery and cholera since Turkana levels of these diseases are recorded as some of the highest in East Africa.
- A regional view of the inevitable expanding *interethnic* armed conflict in the already heavily weaponized border zone is indicated in Fig. 5.3. The points of already existing conflict, along with predictable locales and directions of conflict expansion—identified by this writer and the SONT research team in conversations with community elders—are indicated in Fig. 5.3.²

➤ **A summary of the above impacts in the transboundary region that would lead to catastrophic level human and environmental destruction, involving GOE and GOK violation of U.N. recognized human rights, is shown in Fig. 5.4.**

²Human casualties would far fewer in the more upstream. This 'highland' portion of the lower Omo basin is relatively removed from the tri-nation border zone and has sufficient rainfall to support rainfed agriculture. Like the transboundary region, however, land expropriation and displacement are producing major socioeconomic crisis.

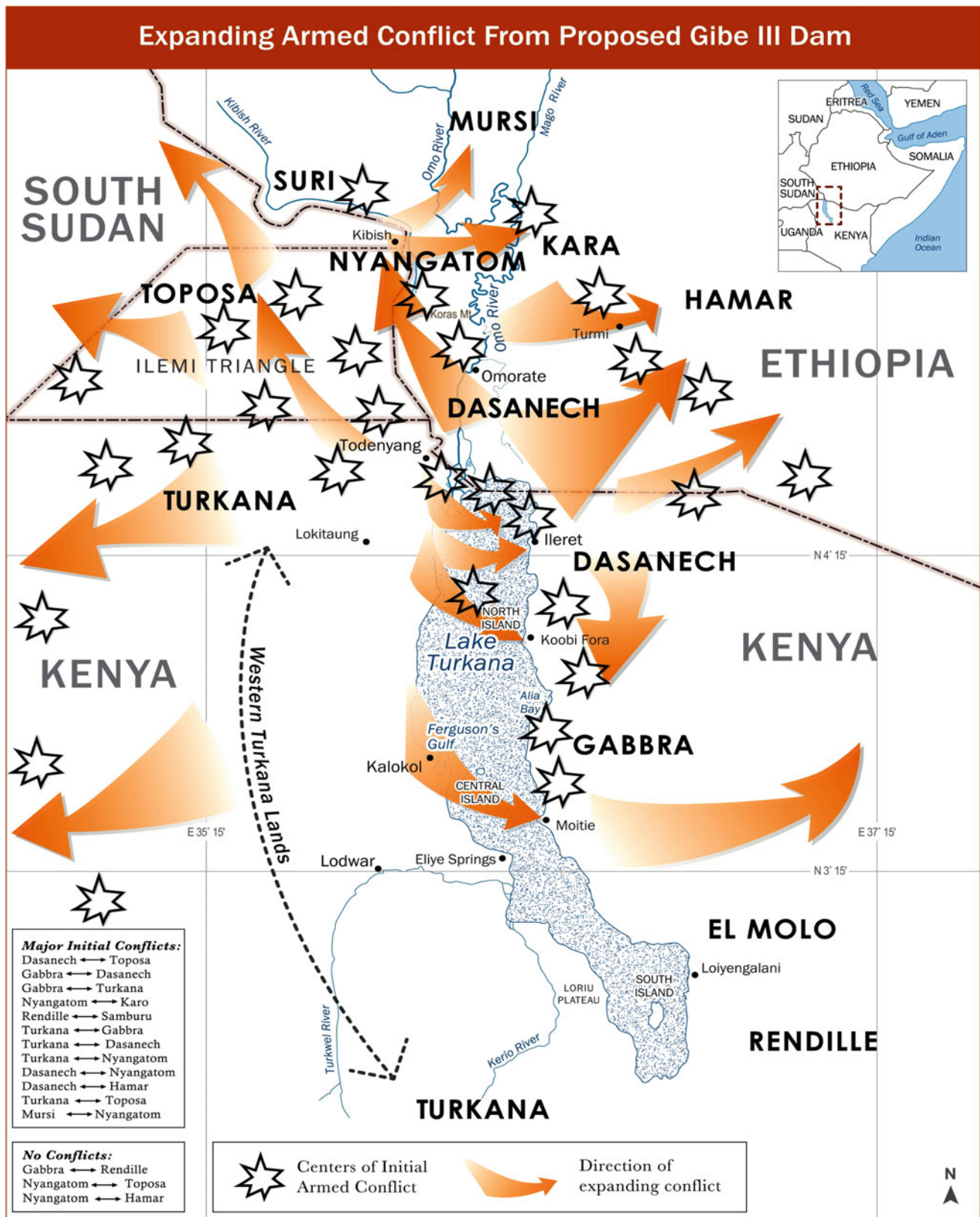


Fig. 5.3 Expanding armed conflict from effects of Gibe III dam and dam-linked development

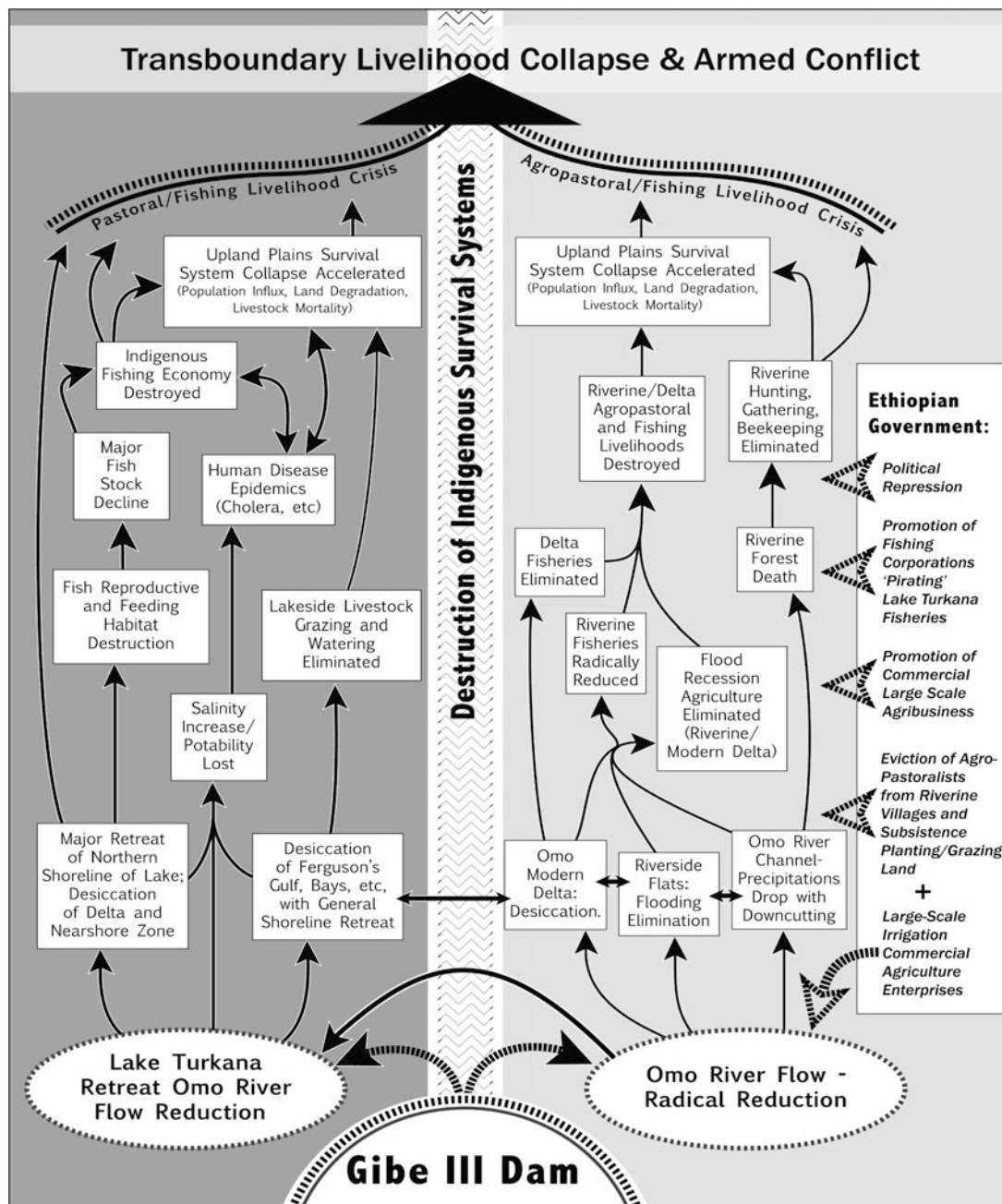


Fig. 5.4 Summary of the humanitarian catastrophe and conditions for armed conflict from the Gibe III dam and its linked large-scale irrigated agricultural development

Consequences for the Lowermost Omo River Basin

1. Omo River flow volume reduction of at least 60–70 % during the reservoir filling period and early dam operation, not including additional river water abstraction/diversion by GOE and private company irrigation agriculture; with elimination of the river's annual flood.
2. Elimination of Omo River flooding in the modern delta (about 500 km²) and southward migration of Lake Turkana's northern shoreline by at least 8–10 km (Fig. 5.2); desiccation of the modern Omo delta and northern Lake Turkana waters.
3. Cessation of annual flooding of waterside point bars (and sand/silt spits) along the entire lower Omo River, with elimination of vegetation communities that are adapted to this flood-driven habitat replenishment.

4. Additional downcutting of the Omo River channel in adjustment to the new lower base level of the lake, with channel scouring, riverbank erosion and disruption of oxygen and nutrient levels in the river—all with major impacts on water quality in Lake Turkana.
5. Destruction of the livelihood of at least 80,000 residents—primarily Dasanech and Nyangatom—relying on flood recession agriculture along the lower Omo River and in the modern Omo delta region, along with tens of other indigenous pastoralist, fishers and others whose survival depends on trade for grain and other agricultural product from farms at the Omo.
6. Elimination of fish reproductive and critical life cycle habitat throughout the modern Omo delta and northern Lake Turkana waters, as well as in Omo riverine environments impacted by major disruption of nutrient, sediment and oxygen content.
7. Destruction of Dasanech and Nyangatom artisanal fishing—the major livelihood for many of the poorest communities.
8. Desiccation of last resort grazing for livestock along the river in response to extended drought periods, intense overgrazing and other hardship conditions—causing major spikes in livestock mortality and new dependence on the cultivated areas at the same time that they are being eliminated.
9. Radical decrease in floodwater quantity and moisture *residence time* (the duration of riverine soil moisture retention) in Omo River natural levee soils, causing destruction of the riverine forest—the last pristine such forest in semi-arid Africa.
10. Destruction of riverine forest/woodland-based secondary food production for local residents, including wild food gathering, beekeeping, hunting and other activities essential to the survival of many of the most impoverished indigenous communities in the lowermost basin.
11. Elimination of ground cover (mostly grasses and forbs) along riverbanks, on natural levee back slopes and in active delta environments—vegetation that requires sustained ‘residence time’ of substantial soil moisture during the river’s annual flood.
12. Lowering of the current limited but critical ground water recharge in the dryland plains lateral to the lower Omo River channel, causing grassland deterioration, increased susceptibility to overgrazing by livestock and accelerated desertification.
13. Major ‘outmigration’ by tens of thousands of households in response to their livelihoods collapsing in the Omo riverine and northern lake region—a process newly impacting neighboring pastoralists who are themselves struggling with similar radical changes.
14. Sharp increase in malnutrition throughout the region, with conditions of starvation taking hold in both riverine and regional dry land plains areas. Estimates by U.N. and non-governmental aid organizations for the region *presently* hover around 40 %, not including years of extreme stress, and sometimes famine.
15. Major spike in disease incidence and conditions promoting widespread increases in malaria, dysentery and other diseases, facilitated by large areas of stagnant water along the river, in canals and backup channels or pools, with severe threat of cholera and other diseases.
16. Major escalation and initiation of armed conflict among ethnic groups, particularly among the Dasanech, Nyangatom, and Turkana in the Ilelmi, Kibish River, Koras Mountain. and Omo delta regions, as well as with the Hamar to the east (Figs. 1.3 and 5.3).

Consequences for the Lake Turkana Region

1. Initial lake level drop of at least 2–3 m during reservoir filling and early operation, with continuing lake retreat to at least 7 m within 5 years. This would create:
 - An extended reservoir-filling period due to seepage through fractured volcanics in the reservoir locale.
 - Inadequacy of the GOE’s planned artificial flood and low likelihood of its implementation.
 - Reduced inflow from Ethiopia’s major diversion of the river for irrigation agriculture.
2. Southward migration of the northern shoreline of Lake Turkana by about 8–10 km further into Kenya during the earliest phase of the reservoir-fill period (Fig. 5.2) with continued shoreline regression likely under reduced inflow conditions. This ARWG prediction is in agreement with the EIB’s (2010) report noting that such a retreat is likely.
3. Desiccation of the modern Omo River delta at the northern end of the lake as well as the entire northern shoreline zone (see Chaps. 7 and 9) and all shallow areas along the western and eastern shorelines.
4. Elimination of the Omo River’s annual flood with its pulse of freshwater, sediment and nutrients—contributing to destruction of major fish reproductive habitats in the modern delta, Ferguson’s Gulf, Alia Bay and other shoreline areas (Fig. 5.2).

5. Salinity increase in lake waters that are already borderline in potability (see above). Lake Turkana is one of the most saline large lakes in Africa. Increased salinity threatens its availability for consumption by hundreds of thousands of local residents, as well as by livestock and wildlife watering.
6. Collapse of fish stocks critical for indigenous fishing communities due to the combination of lake withdrawal and destruction of reproductive and feeding habitats.
7. Destruction and likely elimination of the northern Turkana's artisanal fishing economy—their major last resort means of survival.
8. Collapse of the exchange system fishing, agropastoral, agricultural and pastoral communities, leading to the destruction of food related reciprocity relations in the region.
9. Elimination of most existing shoreline vegetation essential for last resort grazing/browsing by livestock—sparking a radical increase in livestock disease.
10. Loss of remaining grassland vegetation and increased (often irreversible) establishment on unpalatable invasive species, with lowered water table in dryland plains adjacent to Lake Turkana. (These species include *Prosopis juliflora* and other species toxic to livestock.)
11. Destruction of major portions of the northern Turkana pastoral economy due to elimination of water and grazing resources, forcing major new migration from upland plains to the lake, just as fishing there is collapsing.
12. Southern movement of villages along Lake Turkana's western shoreline—conforming to longer term pattern (Fig. 4.6), as fishing and fishing/pastoral Turkana desperately search for relief aid or any last option available in towns (for example, Kalokol and even Lodwar) or at Ferguson's Gulf. Likely swelling of villages and population around Ferguson's Gulf, although the Gulf would be rapidly drying.
13. Epidemic-level disease outbreaks at Lake Turkana, including cholera—already well known in the region, especially around Kalokol/Ferguson's Gulf (Figs. 1.4 and 5.2) and other densely populated locales. Susceptibility to new levels of malaria, schistosomiasis and cholera due to major new areas of stagnant water. All of these health crises would be heightened by the extreme malnutrition conditions.
14. Region-wide extreme malnutrition and starvation conditions among the Turkana, with large populations attempting to migrate to towns or internally displaced persons (IDP) camps.
15. Major interethnic armed conflicts, exacerbated by the widespread availability of arms and the upward spiral of indigenous survival system collapse in the region west of Lake Turkana and in the lower Omo basin (Figs. 5.3 and 5.4).

Consequences for the Ilemi Triangle and the Broader Region

1. Major increase in overgrazing and ecological deterioration throughout the dryland plains of the Ilemi Triangle, due to a large influx of people fleeing hunger conditions along the Omo River and around Lake Turkana (Fig. 5.5).
2. Immediate escalation of existing patterns of interethnic armed conflict due to overcrowding by ethnic groups and competition for vanishing pasture and water. Traditional patterns of interethnic conflict remain, but with greater inclusiveness as stresses on all groups within the region increase. For the Dasanech, conflicts are primarily with their Nyangatom, Hamar, and Turkana neighbors, but also with the Toposa in the Ilemi region and the Gabbra along the eastern shores of Lake Turkana. For the northern Turkana, hostilities most frequently erupt with the Dasanech and Nyangatom. For Turkana fishers camping along the lake's eastern shoreline, hostilities with the Gabbra also occur.
3. Rapid geographic spreading of armed conflict in the cross-border region and internally within the three nations concerned—an inevitable outcome in view of rampant arms availability in the region. AK-47 rifles and other types of weaponry are ever expanding through Kenyan arms merchants and multiple sources—military and otherwise—in the region. Many of the region's residents and outside observers regard the national governments as tacitly supporting the arming of "their own" ethnic groups—as 'proxy forces' in the contested Ilemi region, where oil and gas exploration is also active (Appendix A).
4. Increased militarization in the region by both the Kenyan and Ethiopian governments. This process accelerates as governments react to interethnic conflicts and as they, together with domestic and international investors, advance plans for 'development,' with de facto assertion of control over the region's resources.
5. Cross-border livelihood collapse and conflict (Fig. 5.4).



Fig. 5.5 Ilemi triangle border area with Ethiopia. Lightly grazed Ilemi grasslands on relict beach ridge to the *left*; heavily grazed area with pastoral villages (present and abandoned) to the *right*

These developments include expropriation of indigenous lands for major scale diversion of Omo waters for irrigated commercial agricultural schemes with major infrastructure construction including canals, irrigation systems, roads, and bridge-building. For the region more broadly, they include oil and gas exploration—in Lake Turkana and throughout much of the vast surrounding land areas where petroleum deposits are known or predicted, and land privatization. Within Ethiopia, these development policies are closely tied to the GOE's policies of political repression and violation of U.N. defined human rights—the right to water central among them. Within Kenya, the government's failure to protect its indigenous population from the effects of the Gibe III dam and its attendant agricultural development also violates a major indigenous population's human right to water. Although the matter of severe political repression in northern Turkana remains ambiguous, widespread fear of government reprisals is evident.

Political repression and a climate of increasing hostility accompany militarization in such remote pastoral regions—a reality strongly in evidence in major pastoral areas in the Horn and East Africa. All indications are that increased militarization by the Kenyan and Ethiopian governments will only further the destabilization of the region rather than to promote 'peace,' as the governments and a host of international aid organizations continually assert in public statements.

Literature Cited

- Africa Resources Working Group (ARWG). 2009. A Commentary on the environmental, socioeconomic and human rights impacts of the proposed Gibe III Dam in the lower Omo River basin of Southwest Ethiopia. <http://www.arwg-gibe>.
- African Development Bank (AFDB). (2010, November) S. Avery, Assessment of Hydrological Impacts of Ethiopia's Omo Basin on Kenya's Lake Turkana Water Levels. Final report. 146 pp.
- Avery, S.T. 2012. Lake Turkana and the lower Omo: Hydrological impacts of Gibe III and lower Omo irrigation development, vols. 1 and 2, African Studies Centre, University of Oxford. 92 pp.
- Avery, S.T. 2013. What future for Lake Turkana? The impact of hydropower and irrigation development on the world's large desert lake. African Studies Centre, University of Oxford.
- Carr, C.J. 2012. Humanitarian catastrophe and regional armed conflict brewing in the border region of Ethiopia, Kenya and South Sudan: the proposed Gibe III Dam in Ethiopia, Africa Resources Working Group (ARWG) (Dec 2012), 250 pp. https://www.academia.edu/8385749/Carr_ARWG_Gibe_III_Dam_Report.
- Cerling, T.E. 1986. A mass-balance approach to basin sedimentation: constraints on the recent history of the turkana basin. *Palaeogeography, Palaeoclimatology, Palaeoecology* 54: 63–86.
- European Investment Bank (EIB). 2010. Sogreah consultants, independent review and studies regarding the environmental and social impact assessments for the Gibe III hydropower project, Final Report, Mar 2010, 183 pp.
- Government of Ethiopia (GOE), Ethiopian Electric Power Corporation (EEPCO). 2009b. Agriconsulting S.P.A., mid-day international consulting, level 1 design, environmental and social impact assessment, additional study of downstream impacts. Report No. 300 ENV RAG 003B.
- Hopson, A.J. 1982. Lake Turkana, a report on the findings of the lake Turkana project, 1972–1975, Vols. 1–6, funded by the Government of Kenya and the Ministry of Overseas Development, Overseas Development Administration.
- International Rivers. 2013. Gibe III's impacts on Lake Turkana. East Africa's "Aral Sea" in the making? 10 Jan 2013. www.internationalrivers.org.

Open Access This chapter is distributed under the terms of the Creative Commons Attribution-NonCommercial 2.5 International License (<http://creativecommons.org/licenses/by-nc/2.5/>), which permits any noncommercial use, duplication, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the work's Creative Commons license, unless indicated otherwise in the credit line; if such material is not included in the work's Creative Commons license and the respective action is not permitted by statutory regulation, users will need to obtain permission from the license holder to duplicate, adapt or reproduce the material.

